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## ABSTRACT

The author reviews the literature and offers recommendations regarding the measurement and identification of creative potential. The assessment of creative thinking in measures of intellectual ability is discussed, and various definitions of creativity are cited. Measurement problems are identified and several creativity measures (especially the Torrance Tests of Creative Thinking and Thinking Creatively with Sounds and Words) are described. Results of research concerning the production of analogies are reported and the need for qualitative as well as quantitative analysis is stressed. (LS)

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## MEASUREMENT AND IDENTIFICATION OF THE CREATIVE POTENTIAL

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As you well know, the years that followed the inception of Alfred Binet's contribution to our understanding of intelligence and its measurement in 1904 saw the development of many measures of intellectual abilities. In the main these measures are based on three major theoretical models: (1) Binet's or Wechsler's conception of intelligence as a general or global capacity; (2) the 2 - factor theory of Charles Spearman composed of general mental energy or 'g' and special abilities or 's' refined and elaborated by P.E. Vernon as a hierarchical structure of human abilities with 'g' right on top followed by verbal-educational and k:m or kinesthetic-motor as major and minor group factors, and special factors at the lowest level of the hierarchy; and (3) the multi-factor theory of L. L. Thurstone on the one hand which suggests about a dozen or so group factors that operate without 'g' as a common factor and which he named as primary mental abilities most important among which are comprehension (V), word fluency (W), ability to handle spatial relations (S), number ability (N), memorizing (M), reasoning (R) and perceptual ability (P), and on the other hand J. P. Guilford's structure of intellect as a comprehensive extension of the multi-factor theory in the form of a three-dimension or cube model consisting of operations, contents and productions each broken down

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into sub categories of 5, 4 and 6 respectively to give 120 possible intellectual abilities. These theoretical models with the exception of Guilford's have not included creative or divergent thinking as an essential dimension of mental functioning and hence tests constructed to measure intellectual abilities up to that point did not have items which would call for the function or operation of creative abilities.

Guilford's theoretical model presents five mental operations: four of these namely cognition, memory, convergent thinking and evaluation are in one way or another included in the measurement correlates of prior theoretical models to which he added a fifth dimension that he calls divergent thinking. The recognition of the hitherto neglected operation of divergent thinking as mental activity relative to the creative processes has been the major energy source for innumerable studies over the past two decades.

#### Definitions of Creativity

Definitions of creativity have not been found wanting and this has been all the more because of the intricacies and complexities of human mental functioning. It is no wonder then to find Torda (1970) expressing concern that no universally accepted definition of creativity exists. Among the many cogent earlier ones relative to creative thinking as a process is thinking by analogy (Ribot, 1906), initiative to break away from the usual sequence of thought into an altogether different pattern of thought (Simpson, 1922), a process of seeing relationships with both conscious and subconscious processes operating for the eduction of relations and correlates (Spearman, 1930), and more recently, the distinction between 'cogito' or the ability to shake and throw things together, and 'intelligo' or the ability to choose and discriminate

from many alternative possibilities for synthesizing and binding together elements in original ways (Barchillon, 1961). At no other time in the history of measurement have we had so many attempts to operationalize creativity for its scientific identification. Among those definitions that have led to production of measures of creativity are intellectual operations relative to divergent thinking and redefinition abilities set in motion by a sensitivity to problems (Guilford, 1967), the process of sensing gaps or disturbing missing elements, forming hypotheses concerning them, testing these hypotheses, communicating the results and possibly modifying and retesting these hypotheses (Torrance, 1962), the ability to generate or produce within some criterion of relevance many cognitive associates and many that are unique (Wallach & Kogan, 1966), or the power of the imagination to break away from perceptual set so as to restructure anew ideas thoughts and feelings into novel and meaningful associative bonds (Khatena & Torrance, 1973).

#### Some Measurement Problems

No measure of intellectual abilities have been found to be entirely free from discrepancy, and this is also the case for measures of creative mental functioning. The attendant problems have been well documented (e.g. Anastasi & Schaefer, 1971; Khatena, 1971 1973 ; Treffinger, Renzulli & Feldhusen, 1971; Treffinger & Poggio, 1972; Yamamoto, 1965, 1966). and have centered around problems of theoretical rationale and definition, dimensionality, validity and reliability.

In brief the problem of theoretical rationale and definition arises out of the attempt of the psychometrist to operationalize a universe of intangibles which by its very nature defies complete scrutiny; the

problem of dimensionality arises from the unresolved issues of the relationship between what is being measured by tests of creative thinking and other more traditional intellectual measures; the problem of validity hinges upon sampling of appropriate stimuli from a stimuli universe not fully definable, an inherently discrepant theoretical framework, and the determination of suitable criteria; the problem of reliability impinges upon the operation of extraneous variables in the context of the sociological and psycho-physiological dynamics of subjects relative to test administration and conditions, scoring procedures and scorers, internal consistency of instruments and repeated testing. Ofcourse it must be remembered that many of these conditions and problems of measurement are not uncommon to all measures of intangibles though with creative measures the problems are greater since we are attempting to probe the domain of the rational-irrational. While it is necessary for us to be aware of these problems as they affect creative measures they ought not to inhibit or deter our use of them. What we have to do is to get to know the strengths and weaknesses of the measures we intend to use and make allowances for them in our interpretation of the data they generate for more appropriate appraisal.

#### Measurement of Creative Abilities

Among the foremost psychologists in the field of creativity measurement are Guilford and Torrance. Generally, their measures give major roles to abilities known as fluency or the number of responses that are produced, flexibility or the shifts of thinking from one category of thought to another that are shown, originality or the statistical infrequency of responses produced, and elaboration or the adding of details

to the basic idea or thought expressed though their approaches to the problem of measurement differ. While Torrance (1966) attempts to measure these abilities through the presentation of several complex tasks designed to trigger the expression of these several abilities at one and the same time, Guilford (1967) attempts to measure divergent thinking by using a test format which generally requires the subject to respond to many stimuli each setting out to measure a specific component of the structure of intellect model.

Relative to the associative conception of creativity are (1) those measures constructed by Wallach and Kogan (1965) which attempt to arrange associative conditions for the production of many and unique associates (scored for number and uniqueness of response) both of which are not very different to the concepts of fluency and flexibility described above, and (2) those measures contributed by Torrance, Khatena and Cunningham (1973) which attempt to provide conditions of free association for the production of original or statistically infrequent associations.

Generally the various measures produced by Guilford and his associates concentrate on the measurement of adult creative mental functioning (though many of the measures can be adapted for use with children which to some extent was what Wallach and Kogan did (Guilford, 1971) for children in the upper grades of the elementary school (Wallach & Kogan 1965). The measures developed by Torrance (1966) were constructed for use by children and adults from the preschool years to adult levels, and those by Torrance, Khatena and Cunningham (1973) for use by children

from age 8 and for adults.

### Two Published Measures of Creativity

Of the many measures of creativity published and unpublished that may be obtained (e.g. Kaltsounis, 1971, 1972; Davis, 1971) I shall focus your attention upon the figural and verbal forms of the Torrance Tests of Creative Thinking (Torrance, 1966) which has established themselves for inclusion in the most recent edition of the Mental Measurement Yearbook by Buros, 1972, and Thinking Creatively with Sounds and Words (Torrance, Khatena & Cunningham, 1973), which is to be included in Buros' forthcoming edition of Tests in Print.

The Torrance Tests of Creative Thinking batteries present either verbal or figural material in the visual modality while Thinking Creatively with Sounds and Words battery presents visual or sound material in the auditory modality, with both sets of creative measures calling upon subjects to use their imagination to produce relevant and unique responses. The Torrance Tests of Creative Thinking come in alternate forms and can be administered as a group or individual test using the paper and pencil test form of the verbal measure which is composed of eight subtests, namely, Asking Questions, Guessing Causes, Guessing Consequences, Product Improvement, Unusual Uses, Unusual Questions, and Just Suppose Activities, or using the individual test form composed of four subtests, namely the first four activities already named. The verbal measures call for responses that are

generally scored for fluency, flexibility and originality on each subtest and the the eight or four subtests respectively as a whole. The Torrance Test of Creative Thinking figural measure also comes in alternate forms and comprise of three subtests each (Shape, Incomplete Figures, and Parallel Lines or Circles). Responses are then scored for fluency, flexibility, originality and elaboration per subtest with the composite score on each of these four abilities representing a subject's creative abilities in the figural dimension.

Thinking Creatively with Sounds and Words comprise of two measures of verbal originality entitled Sounds and Images developed initially by Cunningham and Torrance (1965) and Onomatopoeia and Images developed by me (1969). The measures come in two versions (adult and children) and may be administered together or seperately. The battery presents in recorded texts sound and onomatopoeic word stimuli in a repeated presentation format with instructions and encouragement by a narrator to subjects calling them to use their imatination to produce original verbal images and analogies. The responses are scored for originality alone.

Both the Torrance Tests of Creative Thinking and Thinking Creatively with Sounds and Words are timed tests built upon the premise that a certain degree of press is required to provoke creative mental functioning within a framework of encouragement aimed at making legitimate divergent thinking. Awarding credit for creative productions has never been an easy matter and any attempt to do so brings with it a certain element of subjectivity. With both these batteries a good measure of success



has been attained towards objectivity by quantification of responses such that by counting the number of relevant responses produced by an individual we can determine his fluency score, by counting different categories of responses produced we can determine his flexibility score, by reference to a distribution of response frequency we can determine his originality score, and by counting the number of new ideas expressed by details added to the basic idea we can determine his elaboration score. Both the Torrance Tests of Creative Thinking and Thinking Creatively with Sounds and Words score responses for originality by reference to a system of credits ranging from 0 to 5, and 0 to 4 respectively, based upon the principle of statistical infrequency.

#### Need for Qualitative Analysis

It seems to me that while it has been necessary to quantify responses and thereby approach scientific precision in the analysis and interpretation of data, there is also the need to develop a system of qualitative analysis of creative responses. Both Treffinger and associates (1971, 1972) and I (1971, 1973) have focused attention to this need in our recent papers.

My work relative to the interpretation of original responses on Onomatopoeia and Images in terms of the function of the imagination and the production of analogies and original verbal images (1972, 1973b) is only a beginning. I have found the function of the imagination as it relates to the production of analogies a most fascinating and little studied area. Analogy involves comparison of similarities between two unlike objects often with the purpose of explaining something in such a way as to make it more easily understood. Using the Synectics (Gordon, 1961) approach of making the "strange familiar" or the "familiar strange" through analogy I approached the analysis of the analogies

produced in response to onomatopoeic word stimuli of both adult and child subjects. The analogy categories of the Synectics system belong to four distinct classes, namely, personal analogy, direct analogy, fantasy analogy and symbolic analogy. When an individual uses "personal analogy" he identifies himself with the comparison (e.g. I'm thin as a stick); when he uses direct analogy he does not involve himself in the comparison (e.g. Prayer is thunder reversed against the Almighty); when he uses fantasy analogy the subject or object or both subject and object of the comparison must be imaginary (e.g. the icing lay upon the cake like Death's wintry garment); and when he uses symbolic analogy he must compare one phenomenon with another so that both have sign or representation qualities (e.g. He is the cornerstone of my life). The creation of these four kinds of analogies also involves the production of verbal images; enhanced by the function of the imagination these analogies may assume more complex image patterns that are both more interesting and provocative instead of the simple image pattern as for example "John sings like a featherless crow on a winter's day" when compared with "John sings like a crow."

Some creative analogies illustrative of the imaginative process at work as they have been produced by high original men and women as well as boys and girls as they responded to onomatopoeic words in parenthesis are: adults -- "an ant walking on the icing of a cake" (murmur), "crickets in harmony" (jingle), "a frog with an insect stuck on its tongue" (stutter), and slushing watermelon through my teeth" (fizzy); children -- "a bird landing heavily on her nest" (crackle), "a tree growing out of its bark" (moan), "violin on a dog's nerves" (ouch), and "a frightened lizard" (zoom).

To sum up briefly the findings of these two studies, I found that high original adults, adolescents and children seem to use their imagination to produce direct simple image analogies most often, that they show low self-involvement in the analogies they produce, that while adults produce symbolic analogies (though relatively few), children and adolescents show a total absence in the production of symbolic analogies, and that all groups show very little use of fantasy analogy with adults producing more and superior fantasy analogies.

Studies with these instruments have to a large extent centered around the identification of various categories and classes of individuals including the creative potential of the highly gifted, the mentally retarded, the deaf, the blind and the socio-economically deficient, and measurement of the effects of various experimental conditions and manipulations. In addition the Torrance Tests of Creative Thinking has also been used as measures in counselling and clinical situations. However, nearly all interpretations of data derived from these measures have been based upon a quantitative scoring system.

Much remains to be done with these measures of creative mental functioning in the way of teasing out personality variables that would facilitate interpretation and add new dimensions to our understanding of the creative personality. Just as the Stanford-Binet and Wechsler Scales for instance began as instruments for the identification of various levels of intelligence per se for educational direction into clinical tools for the discrimination of personality patterns that go beyond intellectuality for diagnosis and treatment, so too the Torrance Tests of Creative Thinking and Thinking Creatively with Sounds and Words

batteries have the potentiality to move from mere identification of creative abilities through quantification to systems of assessment of personality patterns that may prove them to be worthy additions to the tools of counselling and clinical practice. This may not be easy and may not come quickly for a while, but the challenge is there and to those of us who are adventurous and willing enough to take it up fruitful research and practice most certainly lie ahead.

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